

Appl. No. 09/749,125  
Amdt. dated April 26, 2004  
Reply to Office Action of November 3, 2003

REMARKS/ARGUMENTS

In the Office Action, the drawings were accepted by the Examiner but rejected by the Draftsperson in a PTO-948. A set of the Examiner's approved drawings meeting the formal requirements of the PTO-948 will be presented in due course, as the Examiner noted that this would be satisfactory in a telephone conversation of 4/26/04 with attorney. The substitute specification and abstract filed January 13, 2003 have been entered.

Claims 13 and 15 were objected to because claims 13 and 15, line 10, the limitation "from equation (1)" should be changed to "from an equation (1)" and claim 13, line 16, the limitation "3D" should be written as "three-dimensional" if that is intended meaning of the limitation as stated in the Office Action.

Claim 11 was rejected under 35 USC 112, first paragraph, with respect to the description of a changing of position, as set forth in the Office Action.

Claims 11, 13 and 15 were rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention as mentioned in the Office Action.

Claims 1, 4, 11, 13 and 15 were rejected under 35 USC 102(b) as anticipated by Kobayashi et al, US 5,853,328 on the grounds set forth in the Office Action.

Claims 4 and 15 were rejected under 35 USC 102(b) as anticipated by Parker, US 2,124,006 for the reasons stated in the Office Action.

Claims 4 and 15 were rejected under 35 USC 102(b) as anticipated by Hendrickson, US 1,149,762 on the grounds set forth in the Office Action.

Claims 1, 4, 11, 13 and 15 were rejected under 35 USC 102(e) as anticipated by Pritschow et al, US 5,916,328 for the reasons mentioned in the Office Action.

The following argument is presented to distinguish the claims, as amended, from the cited art, thereby to overcome the rejections and to secure allowable subject matter in the claims.

The title of the invention is changed to correspond more closely to the invention as now claimed.

The claims have been amended to set forth the invention more accurately and clearly so as to overcome the rejections under 35 USC 112, first and second paragraphs, and also the objections raised against the claims.

The claims as amended conform to the specification teaching that the second spherical bearing/support P2 is capable of changing positions relative to the first spherical bearing/support P1 along the axial rod R, and wherein the movement of the first bearing/support is constrained on the rod.

In the present invention, the position of an axial rod (R) is determined by changing position of the first spherical bearing/support, and the direction of the axial rod (R) is determined by changing position of the second spherical bearing/support about the first bearing/support.

The term "coordinates" has been introduced relative to the reference characters  $(X_1, Y_1, Z_1)$ ,  $(X', Y', Z')$  and  $(\theta, \phi)$ , and  $(X', Y', Z')$  is written as  $(x', y', z')$  to clarify the claim language.

The distinctions between the present invention and the teachings of the cited art, presented in the following argument, are believed to overcome the rejections under 35 USC 102.

The most distinctive feature of the present invention is that, the apparatus and method of the present invention relate to the link mechanism for surgical assist robot. Surgical assist robot for MR/T must realize a mechanism to determine at least the position  $(x, y, z)$  and angles  $\theta$  and  $\phi$  to define the direction in 3 dimensional space. It is also desired that the end effector is cleanable and sterilizable. The end effector is also required to

be simple and compact so as not to intercept the view field and the work area of the surgeon. In addition, the output power of actuator should be as small as possible to maintain safety.

The link mechanism of this invention can be composed from substantially only two spherical bearings and one axial rod. These components can be made of paramagnetic material having small magnetic susceptibility, such as ceramics, glass fiber reinforced material, carbon fiber reinforced material, wood, and non-ferrous metal. Active mechanical elements and sensors are not essential. This link mechanism is excellent in MR compatibility, detachable, cleanable and sterilizable. In addition to the above, two spherical bearings/supports are driven by drivers respectively when they change their positions.

In contrast to the present invention, Kobayashi relates power transmission device and constant velocity universal joint, thereof, but it does not relate to a link mechanism of a robot. Further it does not disclose a driver (actuator) which drives two spherical bearings.

Pritschow teaches a device for a platform of so-called Octahedral machine with six telescopic legs, but it does not relate link to the mechanism of a robot. Further it does not disclose a driver (actuator) which drives two spherical bearings.

Hendrickson relates to a supporting member for music instruments, but it does not relate to the link mechanism of robot. Further

it does not disclose a driver (actuator) which drive two spherical bearings.

Parker relates to a dial test indicator, but it does not relate link mechanism of robot. Further it does not disclose a driver (actuator) which drives two spherical bearings.

New claim 17 specifically claims first and second manipulators (finding support in arms 12, 13 of page 4 of specification, and in Fig. 1) as part of the robotic equipment. Such manipulators are not shown in the cited art.

All of the claims are believed to be allowable in view of the foregoing argument.


In the event there are further issues remaining the Examiner is respectfully requested to telephone attorney to reach agreement to expedite issuance of this application.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Since the present claims set forth the present invention patentably and distinctly, and are not taught by the cited art either taken alone or in combination, this amendment is believed to place this case in condition for allowance and the Examiner is respectfully requested to reconsider the matter, enter this amendment, and to allow all of the claims in this case.

A Deposit Account Charge of \$86. for the independent claim 17 fee  
is respectfully presented herewith.


Respectfully submitted,  
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CERTIFICATE OF MAILING UNDER 37 CFR SECTION 1.8(a)

I hereby certify that the accompanying Amendment and Deposit  
Account Charge of \$86. for the claim 17 fee are being deposited  
with the United States Postal Service as first class mail in an  
envelope addressed to: Commissioner for Patent, P.O. Box 1450,  
Alexandria 22313-1450, on April 28, 2004.

Dated: April 28, 2004

  
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